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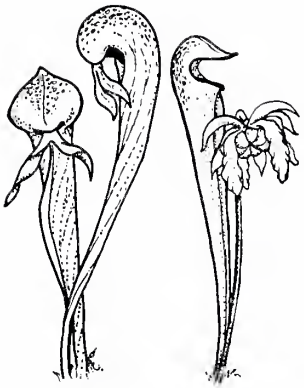

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Front Cover: *Heliamphora sarracenioides*. Photograph by Andreas Wistuba. Article on page 4.
Back Cover: *Utricularia* 'Jitka'. Photograph by Miloslav Studnicka. See article on page 27.

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. Contributors should review the "Instructions to Authors" printed in the March issue of each year. Advertisers should contact the editors.Views expressed in this publication are those of the authors, not the editorial staff.

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D. binata
D. binata—Coromandel, NZ
D. burmannii
D. capensis 'Albino'—white flower
D. capensis—narrow leaf
D. capillaris
D. dielsiana
D. filiformis var. *filiformis*
D. glanduligera
D. graniticola
D. indica—NSW, Australia
D. intermedia—Cuba
D. intermedia—Florida, USA
D. intermedia—Germany
D. intermedia—New Jersey, USA
D. intermedia—North Carolina, USA
D. intermedia—Rhode Island, USA
D. intermedia—Venezuela
D. macrantha subsp. *macrantha*
D. peltata
D. rotundifolia—New Hampshire, USA
D. rotundifolia—New Jersey, USA
D. rotundifolia—Oregon, USA
D. spatulata
D. stenopetala
Sarracenia flava
S. leucophylla
S. purpurea subsp. *purpurea*—Connecticut, USA
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Heliamphora sarracenioides, a New Species of *Heliamphora* (Sarraceniaceae) from Venezuela

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Keywords: new taxa: *Heliamphora sarracenioides*, Venezuela.

Received: 9 March 2004

Introduction

During our last expedition to some of the table mountains in Venezuela in January 2004 we discovered a species of *Heliamphora* (Sarraceniaceae) that has unique characteristics (see Front Cover, and Figures 1-4), and hence is described as a new species here.

Heliamphora sarracenioides Carow, Wistuba & Harbarth *spec. nov.*

Caudex ramosus; foliis rosulatis; amphoris 20-30 cm longis, tubulosis, basin versus infundibuliformibus, in parte media ventricosis, et in parte superiore obconicis, ore versus angustatis extus glabris, parte superiore interiore glabris; appendicibus triangularibus, 2.5-3.5 cm latis, 4-5 cm longis, basi non constrictis.

Inflorescentiis 2-3-floris, racemosis, ad 60 cm longis; flores nutantes; pedicellis 5 cm longis; petalis 4 oblongo-lanceolatis, albidis vel pallide-roseis, 4-4.5 cm longis; staminibus 10, 1-serialibus, filamentis 5-6 mm longis; antheris oblongo-lanceolatis, 7-8 mm longis; ovario valde tomentoso; stylo glabro; stigmate 3 lobato; seminibus fuscis, oblongis, ca. 1.5 mm longis, testa conspicue membranaceo-alata.

Rhizomes branching. Pitchers infundibulate in the lower half, ventricose in the middle and conical in the upper third, slightly narrowing towards the mouth; pitchers 20 to 30 cm long, 3-5 cm wide in the middle; upper part of the pitchers 2.5-3.5 cm wide; the uppermost quarter of the pitcher completely hairless but with scattered glands on the inner side. Underneath this zone the hairy zone starts abruptly. Lid emerging directly from the back of the pitcher mouth without any constriction, 3-4 cm wide and 4-5 cm long, often exceeding the pitcher mouth in width, triangular, upright, ending with a tip that is bent back slightly; sometimes the lids are bent forwards, overarching the mouth of the pitcher; the inner side of the lid fairly evenly scattered with glands, up to 0.2 mm across. Most plants have pitchers that are colored almost entirely red, however plants with greenish pitchers, some veined deeply red, were found as well. Inflorescence up to 60 cm long, with 2-3 flowers, peduncle entirely glabrous, pedicels 5 cm long. All carry bracts, the lowest often is transformed into a rudimentary pitcher. Tepals lanceolate, 4-4.5 cm long, 1.7-2.2 cm wide, white to whitish-pink; approximately 10 stamens in 1 series, filaments 5-6 mm long, anthers oblong lanceolate, 7-8 mm long, 1.5 mm wide; ovary 3 celled, pubescent, style glabrous; seed approximately 1.5 mm long, compressed, ovate, irregularly winged.

Specimens examined

Heliamphora sarracenioides: South Venezuela, Gran Sabana, Estado Bolivar; Wistuba, Carow & Harbarth No. 01/04/s1, holotype, flowering plant (VEN). This specimen we prepared shows a plant typical of the population that we observed.

Distribution

Heliamphora sarracenioides was discovered on a Venezuelan table mountain of the northern part of Gran Sabana. The population we found is healthy, and consists of many plants. (We observed

Figure 1: *Heliamphora sarracenioides* plant. Photograph by Andreas Wistuba.

Figure 2: *Heliamphora sarracenioides* plant. Photograph by Andreas Wistuba.

Figure 3: *Heliamphora sarracenioides* plant. Photograph by Thomas Carow.

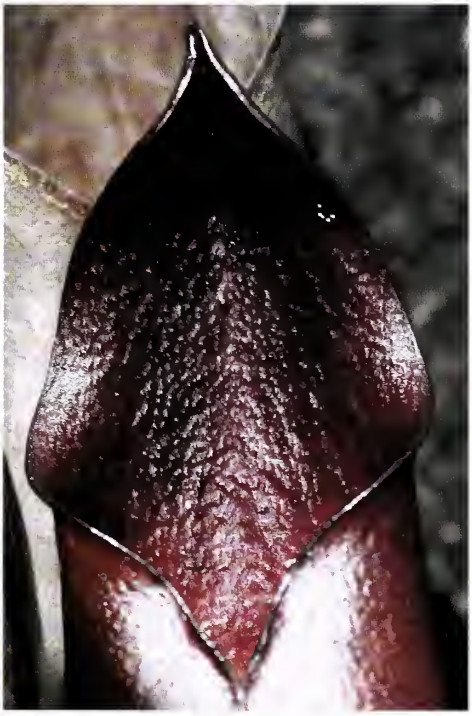

Figure 4: *Heliamphora sarracenioides* pitcher opening. Photograph by Andreas Wistuba.

approximately 200 individual plants, but did not attempt to make an accurate assessment of the total plant population.) Since the population is apparently restricted to a fairly small and isolated area, we believe that it is fairly vulnerable. For reasons of conservation we decided not to present exact data on the location, or disclose what other *Heliamphora* species are found in the immediate area of *Heliamphora sarracenioides*.

Related species

The structure of the flowers with comparably large anthers in one series implicates a close relationship to *Heliamphora heterodoxa* and *Heliamphora folliculata*. The structure of the pitcher, however, with a glabrous zone beneath the rim, separates it well from *H. heterodoxa* which has a more infundibulate pitcher mouth and an upper zone with a hairy inner side of the pitcher wall. Both the evenly distributed, relatively large glands in the lid, and the shape of this lid itself clearly separates *H. sarracenioides* from both *Heliamphora heterodoxa* and *H. folliculata*.

Etymology

The pitchers reminded us of *Sarracenia* pitchers. Therefore we decided to name it *Heliamphora sarracenioides*.

Discussion

The question arises instantly, how the lid of *H. sarracenioides* could have evolved. The pitcher mouth of *Heliamphora sarracenioides* has an extremely broad lid that is often wider than the pitcher mouth itself; this bears little similarity to the pitcher mouth and lid of any other species in the genus (Maguire, 1978; Steyermark, 1984, 1986; Nerz & Wistuba, 2001; Wistuba *et al.*, 2001; Wistuba *et al.*, 2002). The lids of most other species emerge from a contracted base or are highly reduced while in *Heliamphora sarracenioides* it directly protrudes from the back of the pitcher. It is not yet clear how the unique lid structure of *Heliamphora sarracenioides* is related morphogenetically to the lids of other species. As published previously (Wistuba *et al.*, 2001; Wistuba *et al.*, 2002), we base our interpretations of *Heliamphora* systematics on the structure and shape of the gland bearing pitcher appendage (=lid) as one of the most valuable characteristics in *Heliamphora* systematics.

All other known *Heliamphora* species show an interesting dimorphism. Up to a certain age "juvenile" pitchers are produced that show little similarity to the characteristic traps of older and adult plants. The juvenile pitchers of all *Heliamphora* are generally similar, and are in fact strikingly similar to the pitchers of adult *H. sarracenioides* plants, both in shape and the glabrous inner wall of the upper pitcher areas. While it is too early to present any definitive conclusions here, we believe that the pitchers of *Heliamphora sarracenioides* could in fact represent slightly modified gigantic "juvenile" pitchers, and that *Heliamphora sarracenioides* could at least partly have abandoned the dimorphism visible in all other known species of *Heliamphora*. It also seems possible that *H. sarracenioides* represents a very old type of *Heliamphora* that does not yet show the typical dimorphism of the other species known so far. We cannot, however, rule out, that the unique pitcher shape might be the result of a special adaptation during the evolution of *H. sarracenioides*.

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THE BEHAVIOUR OF *DROSERA ROTUNDIFOLIA* L. (DROSERACEAE) TRAPPING LEAVES IN NATURAL HABITATS

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Keywords: Field studies: *Drosera rotundifolia*, Russia – carnivory: *Drosera rotundifolia*.

Introduction

The role of carnivory in plants can vary in different plant communities and also from the availability of different nutrients in the soil (Kraft & Handel, 1991). According to Dore & Maham (1969) and Small *et al.* (1977), carnivory is more or less facultative for *Drosera* species. Furthermore, the influence of carnivory is weak for plants in the natural habitat (Stewart & Nilsen, 1992).

The behaviour of trapping leaves of *Drosera* species was first studied in artificial conditions more than a hundred years ago (Darwin, 1875; also Hooker, 1916). The leaves of most *Drosera* species have short tentacles in the central part of the leaf blade and long marginal tentacles on its periphery. In particularly active species such as *Drosera rotundifolia*, when future prey provide sufficient stimulation to the leaf blade, all tentacles bend inwards and cover the prey with an enzyme-containing slime. Upon stimulation by the prey, there is a (1) rapid movement of tentacles in the first 10-30 seconds after touching and (2) slow movement by tentacles that were not at first in contact with prey. This slow movement is observed within several hours after initial contact (Hooker, 1916; Bopp & Weber, 1981). Juniper *et al.* (1989) state that sundews secrete slime just as the prey is captured. The most intensive slime secretion in *D. rotundifolia* occurs on the second day after prey capture (Muravnik, 2002). After slime secretion, the edge of the leaf blade slowly bends and covers the captured prey. When the digestion process has ended, the leaf blade unwraps, the tentacles straighten and the slime dries (Hooker, 1916).

Secretion activity of the tentacles of *Drosera* is highest when the relative air humidity is high and light intensity is low (Gomez, 1998; Volkova *et al.*, 2001; Volkova, 2002b; Vokova *et al.*, 2003), showing that the behaviour of at least these carnivorous plant traps depends not only on the number and condition of the captured animals. Ostashova (2002) found that the leaves of *D. rotundifolia* move rhythmically independent of prey trapping. In the north of Karelia plants were observed in which the period of such movement was equal to 15 hours and in Vologda region (Middle Russia) plants exhibited a movement period of 12 hours.

Unfortunately, most observations on *Drosera* leaf-trapping behaviour were made in laboratories. This fact does not allow for the natural fluctuations in the number of available prey and the influence of weather factors on the leaf-trapping behaviour to be taken into account. Previously we investigated different aspects of *D. rotundifolia* biology in natural habitats (Volkova *et al.*, 2001; Volkova, 2002a; Volkova, 2002b; Volkova & Shipunov, 2002; Volkova *et al.*, 2002; Volkova *et al.*, 2003). The main goal of the current paper is to investigate the influence of weather conditions and captured prey on the leaf-trapping behaviour of *D. rotundifolia* in the natural habitat.

Materials and Methods

We observed two *D. rotundifolia* plants in Loukhi district of North Karelia, cape Ivanov Navolok (66° 20'N, 33° 20'E) on 25-27 of July 2000 (referred to hereafter as "series 1" data), and two *D. rotundifolia* plants in Vyshnevolotsk district of Tver' region (middle Russia), on the western shore of the Ol'shevo lake (58° 15' N, 34° 30'E) on 20-23 of June 2002 (referred to here-

after as "series 2" data). The daylight duration on 29 July for the series 1 data was lasted 19 h 17 min, and on 29 June for series 2 it was 18 h 17 min (these data are from astronomical software "XEphem", Downey, 2000).

The plants were selected randomly from a typical population that occurred in a typical habitat (wet *Sphagnum* bogs). Continuous, non-manipulative observations on each pair of investigated plants lasted 72 hours in natural, undisturbed conditions. The two plants in the series 1 data had 5 and 4 leaves, while the two plants in the series 2 data had 3 and 4 leaves. For each set of observations we estimated (a) the shape of the leaf blade, (b) the degree of slime secretion, (c) bending percentage, i.e. percentage of curved margin tentacles (see Table 1) and (d) the number of captured prey for each of sixteen leaves chosen for the study. The observations were made every 40 minutes in series 1, and every 30 minutes in series 2, during the entire observation period. In the series 2 data we also measured atmospheric pressure every two hours, air temperature and relative air humidity using Assman's aspiration psychrometer.

Table 1. Criteria of visual estimation of the leaf blade's conditions.

Points	Degree of Leaf Secretion ("wet")	Leaf Blade Shape ("shape")	Degree of Tentacle Bending ("tent")
0	poor (the leaf blade is almost dry)	—not used—	No or few bent tentacles
1	medium	almost flat	The minority of tentacles are bent
2	high (droplets well formed)	flexed	Approximately half the tentacles are bent
3	—not used—	bent	The majority of tentacles are bent
4	—not used—	—not used—	Almost all tentacles are bent

Leaf behaviour for each plant was similar (see below), so for each plant in the study, the "average leaf shape," "average degree of secretion," and "average bending percentage" were calculated as the average of the characteristics for all leaves of each plant during one observation. We calculated non-parametric Spearman correlation coefficients to demonstrate a connection between investigated leaf characteristics, weather conditions and number of captured animals (see Table 2, 4). For calculations we used STATISTICA (tm) software (StatSoft, Inc., 1999).

Table 2. Spearman correlation coefficients between averaged characteristics of each series 1 plant's leaves (N=81, all significant correlation coefficients are included, "wetN av" — average ("av") on all leaves of plant number N degree of secretion).

Correlating Characteristics	Correlation Coefficient
tent1 av & tent2 av	0.59
wet2 av & tent2 av	-0.54
tent1 av & wet2 av	-0.33
wet2 av & shape2 av	-0.25

The Behaviour of Trapping Leaves

In the series 1 observations, reactions in the bending percentage of the leaf blades were not observed in the first hour after capture, but did become evident after 2-3 hours (Table 3). No changes were noticed in the degree of secretion in response to the caught prey. Leaf shape was significantly changed after capture in only two leaves (~22% of the sample).

The condition of leaf blades changed frequently whether or not prey were present. Leaf blades periodically dried when the prey on them had not yet been digested. Tentacles at the margin of 50% of the leaf blades containing prey that was freshly caught, but that had not yet been digested, were not bent; at the same time 25% of these leaf blades remained uncurved. Hence, there was no significant relationship between the different leaf blade characteristics (Figures 1-3, Table 2). For all the leaves of each plant the degree of secretion, the leaf shape and the per-

Table 3. The leaf behaviour in series 1: the percentage of leaves with noticed changes.

Leaf Blade Characteristic	Change after prey came to the leaf blade			Change with no prey	Change with constant number of animals	Previously undocumented leaf behaviour
	< 1 h	1-2 h	3 h			
Secretion	0%	0%	17%	67%	63%	88%
Shape	0%	17%	17%	83%	100%	25%
Bending	0%	50%	50%	100%	75%	50%

centage of bending were related (R=0.4-0.7; $p<0.05$) to averaged leaf characteristics. Consequently, the average characteristics of the leaf blade can be used to describe the common tendencies of the leaf behaviour of any given plant. Moreover, the changes of different characteristics of the leaf blade in different plants were also correlated.

In the series 2 observations, approximately half of the investigated leaves reacted to captured animals less than one hour after its capturing (Table 5). In this time period, 40% of leaves moistened their leaf blades, 50% curved their leaf blades, and 70% increased the degree of tentacle bending. Of the comparatively few plants that did not change their leaf conditions less than one hour after prey capture, almost all did so after 2-3 hours. The degree of secretion and the shape of leaf of 60-70% of the leaves depended directly on the number of caught prey, whereas all leaves without captured prey changed their characteristics in a way that did not have a clear period. Such behaviour was noticed for the majority (70-80%) of investigated leaves when a constant number of recently caught, as-yet undigested prey was observed. Very often completely different behaviour of leaves with fresh animals was observed than is discussed in the literature. Nearly all investigated leaves did not secrete slime while capturing prey and tentacles at margin in 70% of investigated leaves containing undigested animals were not bent (Table 5).

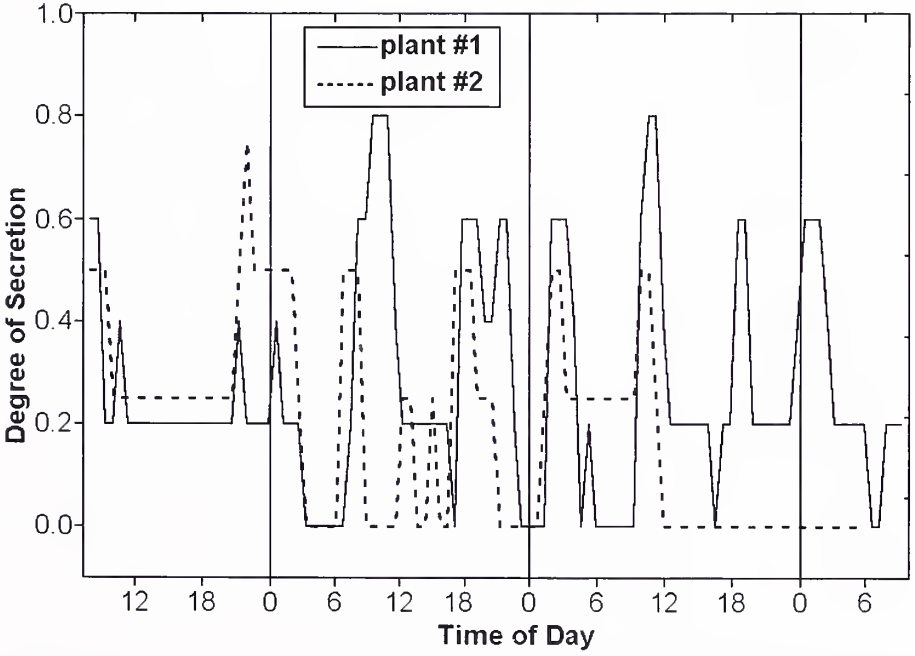

Figure 1: Changes in the degree of secretion for series 1 data. The indices for degree of leaf secretion are described in Table 1. Vertical lines indicate midnight during the series 1 data observations.

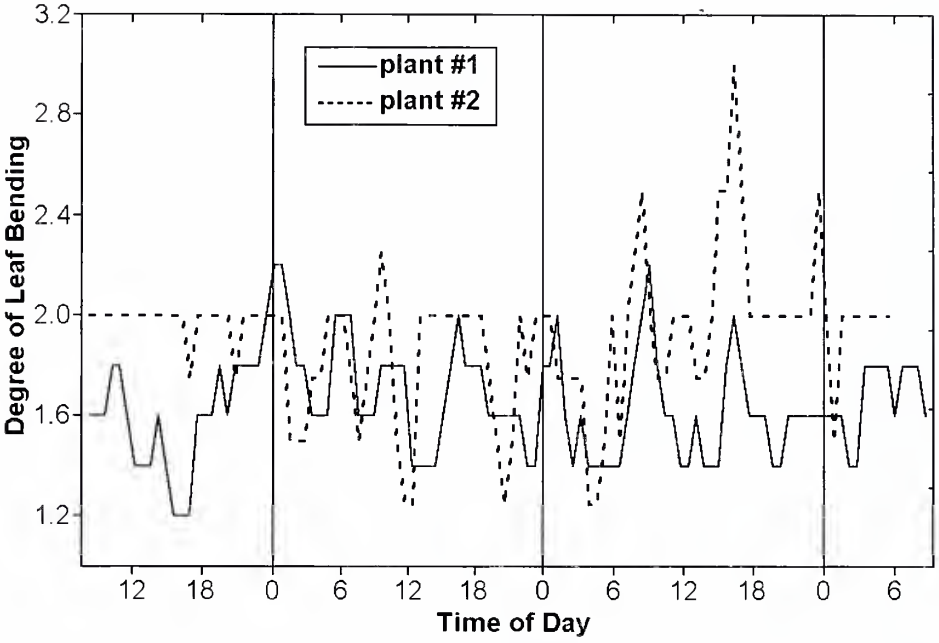

Figure 2: Changes in the shape of the leaf blade for series 1 data. The indices for degree of leaf bending are described in Table 1. Vertical lines indicate midnight during the series 1 data observations.

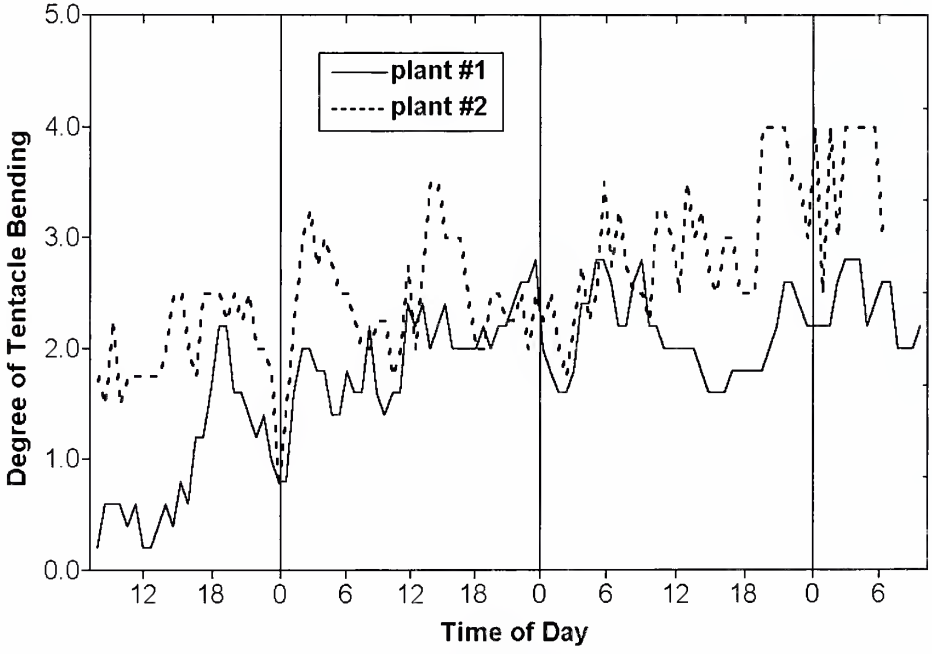

Figure 3: Changes in degree of tentacle bending for series 1 data. The indices for degree of tentacle bending are described in Table 1. Vertical lines indicate midnight during the series 1 data observations.

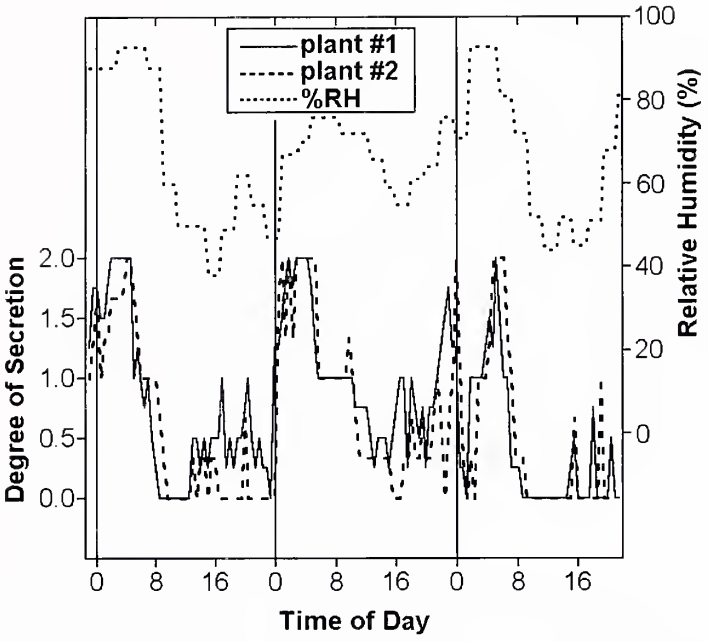

Figure 4: Changes in the degree of secretion for series 2 data. The indices for degree of leaf secretion, measured on the left y-axis, are described in Table 1. The relative air humidity (%RH) is measured on the right y-axis. Vertical lines indicate midnight during the series 2 data observations.

The leaf blade shapes were related to the bending percentage (R=0.4-0.6, p<0.001; Table 4). No significant relationship between the degree of secretion, leaf shape and bending was observed (Figure 4-6, Table 4). As in the series 1 data, the degree of secretion, leaf shape and bending for each leaf in series 2 was correlated with averaged characteristics (R=0.7-0.9, p<0.05; Table 4). An interesting observation is the coincidence in leaf behaviour for all of investigated leaves (Figure 4-6, Table 4).

The degree of secretion for all investigated leaves directly depended on the relative air

Table 4. Spearman correlation coefficients between averaged characteristics in series 2 data. (N=144, all significant correlation coefficients are included, abbreviations as in Table 2, including P for atmospheric pressure, RH for relative humidity, and T for ambient air temperature.)

Correlating Characteristics	Correlation Coefficient	Correlating Characteristics	Correlation Coefficient
wet2 av & wet1 av	0.78	RH & wet2 av	0.61
tent2 av & tent1 av	0.65	T & wet1 av	-0.61
shape2 av & shape1 av	0.64	P & tent1 av	0.56
shape1 av & tent1 av	0.61	P & shape1 av	0.48
tent2 av & shape1 av	0.41	T & wet2 av	-0.46
shape2 av & tent1 av	0.36	P & tent2 av	0.41
shape2 av & tent2 av	0.34	T & shape1 av	0.23
wet2 av & shape2 av	0.24	P & wet2 av	-0.23
shape2 av & wet1 av	0.24	RH & tent2 av	0.20
RH & wet1 av	0.68	P & shape2 av	0.20

Table 5. Leaf behaviour in series 2 data: the percentage of leaves with noticed changes.						
Leaf Blade Characteristic	Change after prey came to the leaf blade			Change with no prey	Change with constant number of animals	Previously undocumented leaf behaviour
	< 1 h	1-2 h	3 h			
Secretion	43%	0%	70%	100%	83%	86%
Shape	57%	43%	29%	100%	67%	29%
Bending	71%	29%	29%	100%	83%	71%

humidity (R=0.5-0.7, p=0; Figure 4, Table 4). In all investigated leaves it was noticed that there was a less positive dependence between bending degree and leaf shape and between leaf shape and the atmospheric pressure (R=0.2-0.5, $p<0.05$; Figure 5, 6, Table 4) from another. However, dependence of the captured prey number on the weather conditions was not observed.

The daily average air temperature (17°C) in the observation period remained constant. The air temperature fluctuations daily existed from minimum of 9°C (at 5-6 a.m.) to a maximum of 26°C (2-3 p.m.). No significant influence of air temperature on of the leaf blade characteristics was observed. Weak dependence of characteristics of the leaf blade on air temperature, observed for some leaves, are definitely caused by the clear negative relationship between the air temperature and relative humidity.

Discussion

Our observations show that in both our study sites for *Drosera rotundifolia*, different characteristics of the leaf blades that we studied exhibited changes that were independent both from each other, and from the presence of prey. However, the different leaf changes were more correlated in the plants from middle Russia than in those from the arctic region. Moreover, the leaf

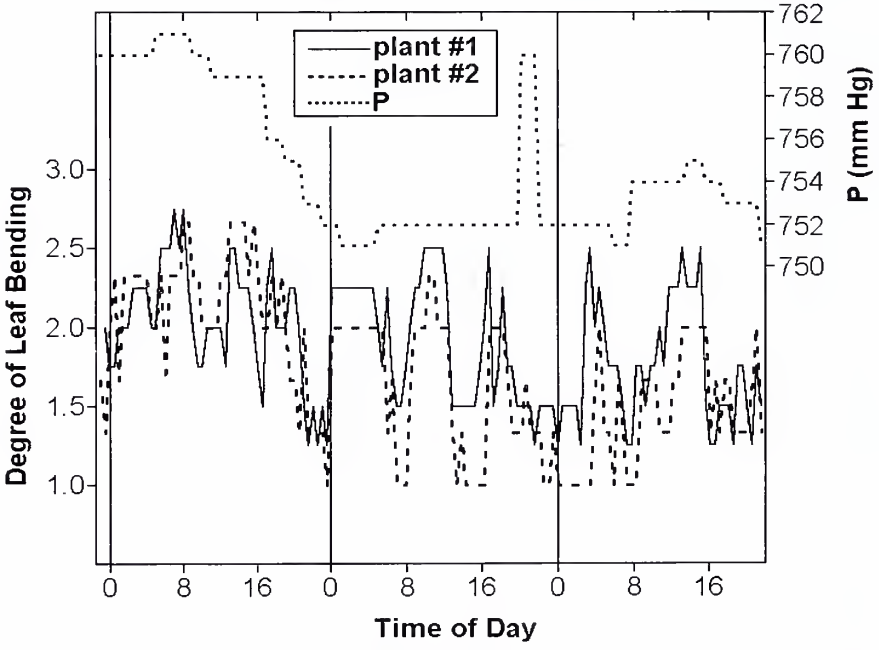

Figure 5: Changes in the shape of the leaf blade for series 2 data. The indices for degree of leaf bending, measured on the left y-axis, are described in Table 1. The atmospheric pressure (in mm Mercury) is measured on the right y-axis. Vertical lines indicate midnight during the series 2 data observations.

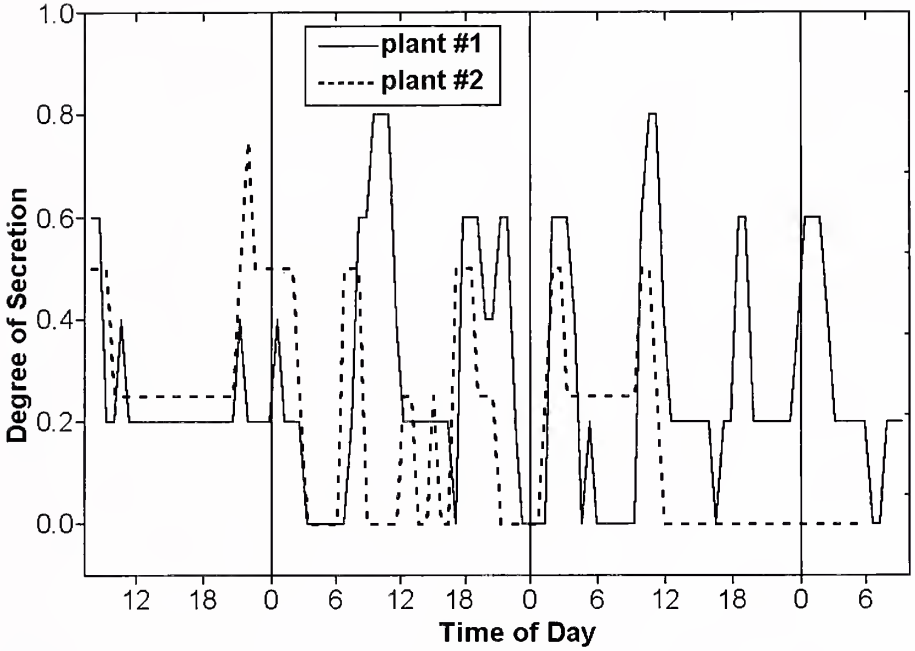

Figure 6: Changes in degree of tentacle bending for series 2 data. The indices for degree of tentacle bending, measured on the left y-axis, are described in Table 1. The atmospheric pressure (in mm Mercury) is measured on the right y-axis. Vertical lines indicate midnight during the series 2 data observations.

reactions to the capturing of prey were more dramatic in the plants from middle Russia. Such differences are probably related to harder habitat conditions expected by *D. rotundifolia* in the Arctic region in comparison with temperate Middle Russia, which could influence negatively the co-ordination of feeding behaviour.

The degree of moistening in the leaf blades for carnivorous plants is at least partially dependent on the relative air humidity. This behavior is not, however, related to cost-benefit models of plant carnivory (Ellison & Gotelli, 2001); while plant carnivory is well-known to be more important in wet habitats than in dry ones (Gomez, 1998; Ellison & Gotelli, 2001; Volkova, *et al.*, 2003), our investigations of the changes in secretion intensity occurred *in situ*, where the humidity and moisture levels were relatively constant.[1] The chemical composition of slime changes in prey capture (Muravnik, 2002) while the amount of the slime produced is practically constant. The relation of leaf-blade shape and tentacle bending to atmospheric pressure was probably caused by the dependence of leaf characteristics on the internal cellular pressure. The laboratory observations on the trapping-leaf behaviour (Darwin, 1875; Hooker, 1916; Muravnik, 2002) could not take into account the influence of weather conditions on the leaf blade conditions, which can exceed the effect of captured prey in natural conditions.

The correlated behaviour of leaf blades from different plants also indirectly shows the absence of dependence between trapping leaves behaviour and prey. This fact was also investigated by field observations of Ostashova (2002).

We propose that the changes of the leaf blade characteristics of *D. rotundifolia* are probably casual and are augmented only by the external factors such as relative air humidity, atmosphere pressure and presence of the prey on the leaf blade. No rhythmic, diurnal motions of the

[1]In August 2003 we manually applied prey to leaves of plants in north Karelia. We observed the same leaf reaction under conditions of both very high relative air humidity (frequent rains), and low relative air humidity (dry weather). This observation shows the absence of influence the relative air humidity on interactions between prey and leaf.

leaf blades were observed, contrary to the observations of Ostashova (2002). Thus we can consider that secretion, leaf blade curving and tentacle bending at some time after prey capturing in most cases is a coincidence. This situation is not unique, because the active reaction of traps on the captured animal is not an obligatory attribute of the carnivorous plants. Some *Drosera* species, e.g. *D. binata*, have large leaves that simply cannot change their shape relatively fast. Phylogenetically close *Nepenthes* (Nepenthaceae) species have pitcher-traps that do not capture the prey actively (Ellison & Gotelli, 2001). It is possible that only in *Aldrovanda* and *Dionaea* (Droseraceae) prey capturing and changes in leaf-trapping characteristics are strongly related.

Our data on the absence of clear linkage of leaf-trapping behaviour and presence of captured animals for *D. rotundifolia* support the recent hypothesis on the facultative role of carnivory in the carnivorous plants (Dore & Maham, 1969; Small *et al.*, 1977; Stewart & Nilsen, 1992; Ellison & Gotelli, 2001).

Acknowledgements.

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Looking Back: CPN 25 years ago

This issue's "Looking Back" selection is not a fragment of text, but is instead a photograph. If you have a copy of the now twenty-five year old issue 8:1, treat yourself by looking at the photograph on page 23. Compliments of Longwood Gardens, the photograph appears to be of a girl pouring herself a glass of orange juice, perhaps for breakfast. What is the connection to carnivorous plants? Look at the photo yourself, and ask yourself if you would want pulp in your juice!

Disease Symptoms in *Pinguicula*: Some Causes and Remedies

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Keywords: cultivation: diseases, pests, *Pinguicula*.

Introduction

Pinguicula species are lovely, little and fragile plants that under good conditions may develop quickly, or frustratingly die just as rapidly for some unknown reason. Even more frustrating is the fact that there is virtually no published information that adequately describes disease symptoms and suggests possible cures. The only disease of *Pinguicula* that has received attention is caused by a filamentous fungus called *Ustilago pinguiculae* (Casper, 1966). This fungus emasculates plants by infecting their pollen. This does not allow the plants to produce seeds and, as a side effect, leads to an enlargement of the vegetative parts. Only some temperate *Pinguicula* are known to be affected.

During the summer of 2000, we observed the recurrence of several diseases in the large collection of Helmut Kibellis. We then subjected several diseased plants to microscopic and microbiological test, and, in the spring and summer of 2001, we investigated several modifications to the growing conditions that appreciably improved the overall health of our collections. This article describes some of the diseases that we encountered and some measures for controlling them. We believe that these diseases are not exclusive to the Sydney region but are found on all major continents.

Materials And Methods

Unless otherwise stated in the text, Mexican *Pinguicula* described in this article were grown in a 1:1:1 mix of perlite, vermiculite, and peat. *Pinguicula lutea* was grown in a 3:1 peat/sand mix. The plants were not fertilized.

The plants of this study were routinely grown by Helmut Kibellis in a glasshouse on a hill in the outskirts of Sydney. The glasshouse was not heated nor cooled and shade was provided by a nearby tree. There was no automatic watering and pots were sitting in trays. The door and some glass panels were opened most of the year. On average, temperatures fluctuated between 18°C to 30°C (64-86°F) in the summer and -1°C to 20°C (30-68°F) in the winter.

Infected plants were transferred to a shade house next to the glasshouse. A 50% shade cloth was used. Temperatures were 2°C to 5°C (1-3°F) lower than in the glasshouse.

Infection and cultivation experiments were conducted on the Hawkesbury campus of the University of Western Sydney. Plants were gown in a polyethylene tent inside a reinforced polyethylene greenhouse. Temperature was lowered by an evaporative cooler and heavy-duty fans. Plants were sprinkled every 5 minutes. Pots were sitting on top of coarse sand to raise air humidity and allow adequate drainage. On average, temperatures fluctuated between 25°C to 35°C (77-95°F) in the summer and 15°C to 25°C (59-77°F) in the winter.

Browning Heart Disease (center-to-edge rosette death)

This is a disease that causes one of the most spectacular, sudden deaths of *Pinguicula* plants. It is characterized by the browning (dark brown/black) and death of the center of the

Figure 1: Browning heart disease in *Pinguicula rectifolia* plant. The dead rosette center is infected by nematodes and *Fusarium*.

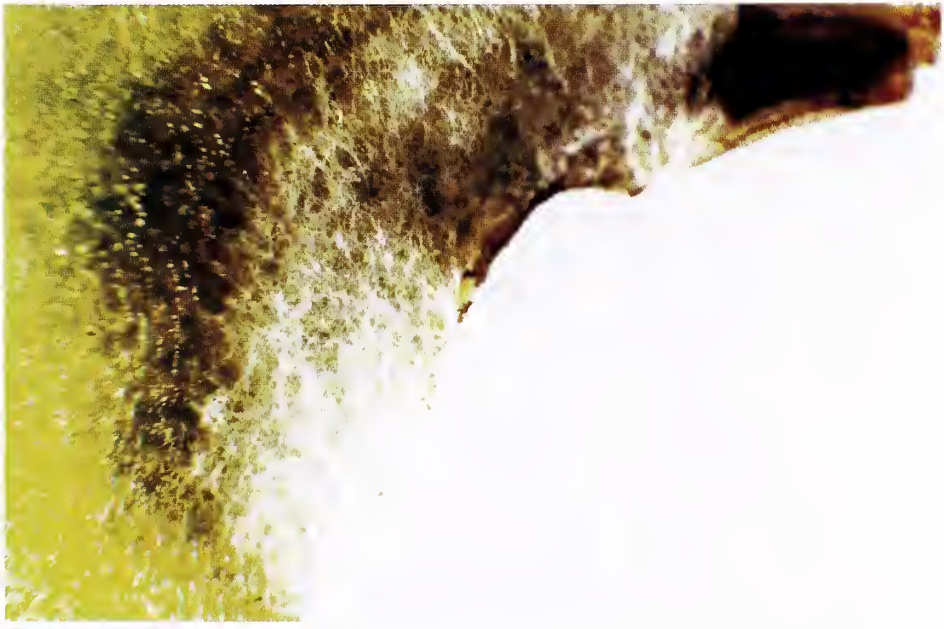

Figure 2: Browning heart disease in *Pinguicula rectifolia* plant at 10X magnification. The dead leaf shows *Fusarium* hyphae emerging from the dead zone.

Figure 3: *Fusarium* spores. Spores were extracted from the soil that surrounded a browning heart diseased plant, stained with cotton blue for enhanced contrast and examined with a light microscope at 400X magnification. *Fusarium* spores exhibit a typical sickle shape and cell wall boundaries between cells.

rosette that rapidly (in a couple days) spreads to the tips of all of the leaves. This symptom is most often seen on central American *Pinguicula* during the spring or hot summer days and has a tendency to be epidemic in a collection. It is particularly severe in the Sydney region because of the hot and dry springs/summers (especially the period of three months from October to December). We refer to it as browning heart disease. Early signs of this disease include a loss of vigor and no new leaf growth (even though spring should witness the abundant production of fresh new growth). Plants are stagnant with non-mucilaginous, dull green leaves. There is no development of young white roots and, if the plants had them when they were healthy, the roots turn brown, shrivel and die. The rootless base of the plant becomes a black stump that looks like a tap root—typically an 8 cm (3 inch) diameter plant will produce a 1 cm (0.4 inch) long black root stump. The base of the leaf petioles then turn rusty-brown before the center of the rosette blackens and the whole plant dies.

During each of two separate outbreaks of browning heart disease that we observed, three sick *P. rectifolia* plants were sampled (i.e. a total of six plants). The tips of the leaves of these plants were still green while their bases were brown (Figure 1). Microscopic observation revealed the presence of numerous fungal hyphae entering and leaving the brown area (Figure 2). Depigmentation and softening of the tissues in a zone between the brown and healthy areas could also be seen—these effects are typical of spreading fungal infections. Tissue samples (1×1 mm) taken from the brown area of three separate leaves of each of the diseased plants were plated on sterile potato dextrose agar medium. In each case, a similar white mycelium grew rapidly from the sampled tissue. After about two months, conidia developed and were examined under the microscope for identification. The fungi invariably belonged to the genus *Fusarium* (Figure 3).

All of the plants under study were gently unearthed. A sample of soil from just under the center of the rosettes was mixed with a drop of sterile water and examined under the microscope. Vast numbers of *Fusarium* spores and nematodes were observed. Male and female nematodes could be seen (Figure 4). The presence of nematode damage near the base of the dead roots was also visible. On a live root, each point of damage from the nematode looked like a swollen brown

Figure 4: Nematodes extracted from the soil that surrounded a browning heart diseased plant, visualized with a field contrast microscope at 400X magnification. The photo shows a large female at the center and two smaller males around her.

dot. If peat was used in the potting mix, tiny peat particles adhered to the wounds after rinsing the roots under a stream of water.

Several cuttings made from the green portions of half-dead leaves took root, therefore suggesting that the leaves did not suffer from any internal physiological disorder.

The above observations suggest that the browning heart disease in Mexican *Pinguicula* is associated with a combination of *Fusarium* and nematode attack. Such a combination is lethal to numerous plant species. Female nematodes will enter plant roots to feed. This leads to a weakening of the plants. *Fusarium* spores and hyphae naturally present in the soil are normally unable to penetrate intact tissues but will enter the wounds made by the nematodes. From there, the fungus will quickly develop through the plant to lead to its death. Interestingly, my experiences in plant pathology have shown me that central and south American plants (such as cacti, tomato, potato, etc.) are more sensitive than other plants to such a combination of *Fusarium* and nematode attack.

Rosette Edge-to-Center Death

A different sudden death syndrome plagues *Pinguicula* species from the southeastern USA. In this case, the symptoms appear in late winter/early spring when the temperature is raised too rapidly. It is characterized by a browning of the tip of the leaves that spreads towards the center of the rosette. It will be referred to as rosette edge-to-center death. Tests for the presence of microbial contaminants have been conducted on dead parts as described above. However, no pathogen could be extracted from the brown areas. Therefore, this symptom, which occurs on winter-resting plants during rapid elevations of temperature, most likely stems from an internal metabolic imbalance resulting from a differential acceleration of the various metabolic pathways during temperature rises. Enzymatic systems work as a chain factory so that the greater excitation of some elements by increased temperature over others will lead to the accumulation in the tissues of the plant of intermediate toxic metabolites that can lead to self-poisoning. This explanation is compatible with the observation that, once induced, the dying back never stops even if the necrotic area is cut off (the plant has actually poisoned itself completely during a temperature shock and we are witnessing the differential spread of senescence of its tissues). Slower elevations of temperature (as are more common in outside settings like in natural environments than in glasshouses) allow survival since they provide more time for the plants to re-equilibrate their enzymatic activities and adapt to higher temperatures.

Figure 5: Whitening of the center of a *P. rectifolia* plant due to mineral deficiency.

Figure 6: A *Pinguicula lutea* plant with white leaf symptom.

Figure 7: A cross-section of a white *P. lutea* leaf was examined with a light microscope (12X). Most cells appear white. Only a few cells located close to the tracheid elements (center of section) and on the leaf underside contained chloroplasts (small green balls).

A less serious disease involves the melting (total disappearance) of leaves as they touch the soil. The breakdown of the tissue often starts at the spot where the leaves touch the soil. A round hole develops in the middle of the leaf lamina that expands to the rest of the leaf in a few days. The formation of such holes may lead to the death of a whole leaf but rarely results in the death of the whole plant. Microbiological tests conducted on the dead tissues revealed the presence of either of two types of filamentous fungi, *Botrytis cinerea* or *Trichoderma* spp. These two types of fungi are necrotrophic pathogens that normally live upon dead plant parts. *Trichoderma* species are rarely pathogenic to plants (in fact, they often act as biological control agents by preventing the development of other pathogenic fungi). When grown on a Petri dish, the *Trichoderma* spp. extracted from the *Pinguicula* leaves exuded an attractive coconut smell. The *Botrytis* isolates that were extracted proved to be incapable of infecting healthy *Pinguicula* plants when added onto their leaves as conidia or mycelial plugs. Therefore, it seems likely that these infection holes may be the result of potassium/calcium deficiencies in the plant since in many horticultural crops such deficiencies lead to greater sensitivity to microbial attack by weak pathogens (Resh, 1995).

To test this hypothesis, *Pinguicula* of several species (1 cm rosette diameter, from tissue culture) were transplanted into large polystyrene foam boxes filled with standard peat/sand media. Both a control mix and a richer mix (Mix A, derived from a University of California, Davis hydroponic mix; see Resh (1995) for details) were used.

The lamina hole symptoms did not appear on plants grown in Mix A and older leaves survived much longer. In some instances it led to the production of rosettes bearing a greater number of leaves and the stacking of several layers of green leaves. The plants in general looked healthier, grew faster, and in some instances, bloomed more and generated more seeds. The addition of extra nitrogen to the mix (Mix B—Table 1) led to no further stimulation in plant growth but allowed the resumption of lamina hole formation.

After three months of growth, the rosette diameters were measured. Flower production was monitored for six months after initial insertion of the plants into the media. The results are given in Table 2. We believe the resumption of lamina hole formation was because high nitrogen fertilization typically leads to increased sensitivity to microbial attack and to the greater development of microbes in the soil (Resh, 1995).

Table 1: Composition of potting mixes

Component	Control Mix	Mix A	Mix B
peat moss[1]	5 kg (=1V)	5 kg (=1V)	5 kg (=1V)
sand[2] (1 mm quartz)	1/2 V	1/2 V	1/2 V
potassium nitrate	—	11.34 g	11.34 g
potassium sulfate	—	11.34 g	11.34 g
superphosphate	—	113.6 g	113.6 g
dolomite lime	—	341 g	341 g
calcium carbonate lime	—	113.6 g	113.6 g
trace elements	—	3.865 g	3.865 g
blood and bone	—	—	113.6 g

[1]Peat moss originated from Lithiania.

[2]The base of these mixes is made by combining two parts (by volume) peat to 1 part sand.

Table 2: Growth characteristics of *Pinguicula* species on two potting mixes.

Species	Control mix		Mix A	
	Rosette diameter[1] (cm)	Flowers presence	Rosette diameter[1] (cm)	Flowers presence
P. agnata	2.5	No	8.2	Yes
P. filifolia	4.3	No	5.3	No
P. crystallina subsp hirtiflora	2	Scarce	3.75	Yes
P. emarginata	2.3	No	4	Yes
P. lusitanica	1.7	Yes	1.7	Yes
P. moranensis	5	No	5	Yes
P. primuliflora	1.7	No	2.6	No
P. sp.—Ayautla[2]	2.5	No	24	Yes
P. sp.—Huahuapan[2]	1.5	No	2.3	No
P. sp.—La Vuelta[2]	4	No	4.2	No
P. sp.—Pachuca[2]	4	No	5.8	Yes
P. sp.—Synalta[2]	9	No	21	Yes

[1]Rosette diameters were recorded three months later and flower formation over a period of six months. Values represent the average of recordings made on at least three plants. Standard deviations were less than 10% of the mean.

[2]The identification of this plant is unknown. The name after the dash indicates Mexican provenance information.

Leaf Whitening

Another minor disease symptom involves the whitening of old or young leaves (Figure 5). These symptoms are common, and, generally speaking, *Pinguicula* plants tend to look whiter in most collections than they do in their native habitat. As for most plants, this may result from a deficiency in various microelements such as zinc, boron or iron (Resh, 1995). In agreement with this hypothesis, growing some *Pinguicula* species in Mix A or Mix B led to the re-greening of their leaves within three months.

There is another form of leaf whitening that is specific to *P. lutea*. In the summer, the central section of the newly developing leaves turn pure white while the tips and bases remain green (Figure 6). Microscopic examination of sliced white parts did not reveal any damage caused by insects, mites or thrips. The cells lacked chloroplasts but looked healthy (Figure 7). The most likely cause of this symptom is an excess of light since a plant growing under shade redeveloped green leaves.

Discussion

Our study reveals that disease symptoms in *Pinguicula* are not always linked to microbial attacks. Temperature shocks, light induced bleaching and mineral deficiencies can all generate physiological disorders, and in the case of temperature variations, may lead to death. Mineral deficiencies are particularly common in hobbyists' collections because of the widespread use of perlite/vermiculite mixes and no fertilization. These are hard to spot just after repotting and may take several months to fully develop. A transient improvement in plant health may even appear at first because of the washing of excess salts from a previous mix or sudden improved aeration. However, the nutritional needs of *Pinguicula* and their relationship with temperature, soil pH and texture are unknown. Our study also suggests that one mix may not fit the needs of all species (see the different reactions of different species to Mix A) and preliminary results showed that young plants tend to prefer a poorer mix than their adult forms. More work is required in this area.

The most severe microbe-related disease we found was linked to the penetration of *Fusarium* spp. into plant roots via wounds made by nematodes. Even though both protagonists need to be present simultaneously to kill the plants, their ubiquitous nature in the air and water

respectively makes this deadly cocktail a common occurrence feared by most nurserymen. There is no obvious cure for this. Most nematicides greatly reduce nematode colonies but never eradicate them (e.g. Nemacur 400® - 0.1% fenamiphos) so that within three weeks after treatment, their ranks regrow. Similarly, anti-*Fusarium* fungicides (we tried Bayleton® from Bayer) only stop momentarily the development of the fungus (these substances should be called fungistatics rather than fungicides), as its growth will resume about two weeks later. Since the movement of air-borne spores of *Fusarium* species is hard to prevent, the focus of any cure is usually to prevent nematode entry into the collection. Nematodes are carried via contaminated water, utensils and soil pieces attached to shoes. Nematodes are, however, very sensitive to heat (hot water or steam). We, now, routinely heat-sterilize our potting mixes (for example, in a Chinese crock-pot instrument). Instruments and pots are soaked in bleach prior to use. The use of large trays or shared cascade water is dangerous because any contaminated pot will infect its neighbors. Occasional outbreaks are unavoidable and infected plants should be quarantined swiftly. Our only success in saving infected plants has been obtained after moving the affected plants away from the healthy ones from their original glass-house to a separate shade-house (50% shade cover) to improve ventilation. The plants were kept totally dry and after several weeks, new growing points could be seen at the base of the petioles (like in leaf cuttings) and at the center of the sick rosette. At that stage, the plants were potted into sterilized pots and potting mix.

The new use of overhead sprinklers that automatically (timer-controlled) water our plants briefly a couple times per day (9 a.m. and 4:30 p.m.) has greatly helped in many ways. First, it replaced the use of trays, which act as a pathway for nematodes to spread from pot to pot. Second, it prevents the accumulation of abundant water-borne salts while providing access to larger quantities of trace minerals to the plants. Third, by using overhead sprinklers, a larger volume of water (and its minerals) flows past the roots compared to the tray system. The plants are, therefore, less likely to exhibit mineral deficiency symptoms. Fourth, overhead watering also cools the plants and their potting mixes and therefore prevents sun-induced heat damage in closed glasshouses. Finally, the passage of a layer of water from the top to the bottom of the mix keeps the water in the soil oxygenated. It brings fresh oxygen to the roots and removes the CO_2 the roots have been producing via their own respiration.

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The authors wish to acknowledge V. Sergeeva for helping in the identification of fungal isolates and Professor Tan Nair for lending some of his research equipment. They also wish to thank Professor B. McGlasson for proof-reading this manuscript.

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Special Review: Three Products for the CPer

Reviewed by Barry Rice

Cans of Bugs

It seems I never have time to feed my carnivorous plants. I have so many, and there are never enough bugs around. But recently, I discovered that ICPS member Mike Howlett operates a small business called "Houston Herpetological Supply" (www.houstonherp.com), and he sells cooked, canned insects that are perfectly suited for carnivorous plants!

While really intended for reptiles, the canned insects that Mike sells are an inexpensive and convenient way to keep plant food around for whenever you wish to give your plants a few yummy little morsels.

While there are several related products in Mike's larder, one of the best for the carnivorous plant enthusiast is the "Can O' Crickets." For US$7, you get about 200 three-week-old "mini-crickets" (*Gryllus* sp.), each about 1.5 cm long. The net weight of the can's contents is 35 grams, or 1.2 oz. These mini-crickets are excellent for feeding to most *Nepenthes*. For US$6, you can also buy a "Can O' Crickets" that contains mature crickets. These crickets are quite large—about 2-3cm long—and are only really suitable for very large *Nepenthes*. Both products proudly note "Natural Juices Locked in the Can!" (I find this information to be marvelously grotesque.) Another fine product for the carnivorous plant enthusiast is the US$6 "Can O' Pillars", which as you might guess, contains a comparable mass of 2-3cm long caterpillars (*Erionota thrax*). The labeling helpfully informs that caterpillars act as laxatives for reptiles. (Another new piece of information for me!)

Do not mistakenly think that these products are useful only for *Nepenthes*. I use my dissecting scissors to cut mini-crickets into segments, and feed the fragments to my *Dionaea*. The plants are quite appreciative. (I assume the reader knows, of course, how to stimulate the trigger hairs of *Dionaea* a second time to induce the plant to digest even non-living tissue.)

The caterpillars are particularly well suited for smaller carnivores like *Drosera* and *Pinguicula*. Once thawed, the end can be cut off a caterpillar, and its white internal goo can be squeezed out (like toothpaste). A small amount of the caterpillar paste can be placed on a dissecting needle (or similar tool), and wiped onto leaf surfaces. Yes, this is all horrible, but the plants benefit from the exertions.

Shipping within the USA is only a few dollars—international shipping is possible but would be more expensive. Contact Mike via his web site or at 281-433-3286 for details.

For completeness, I note that Mike also sells "Can O' Snails," and "Can O' Mealworms," both priced at US$6. I was not particularly interested in experimenting with these (and must admit I could not bring myself to opening the Can O' Snails—I enjoy escargot on rare occasion and did not wish to spoil my future culinary experiences with uncomfortable memories.

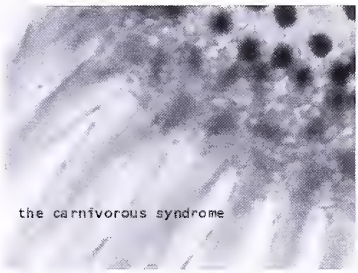
Mike advised me to store opened cans in the freezer—the food items are easily thawed a few at a time. Certainly, bugs from the backyard are free, but if you have a large number of plants in comparatively bug-free environments such as terraria, it is unlikely you will have the time or desire to catch as many bugs as you would like. Having an essentially unlimited supply of bugs is a sweet luxury! Just make sure you feed your plants small portions—it is easy to overfeed your plants when you have so many bugs in your pantry.

Tetra Delica Bloodworms

While researching to write the previous product review, ICPS board member John Brittnacher showed me how he feeds his plants. He buys dried "bloodworms" from a local petfood supply (Tetra Delica Bloodworms). A plastic bottle of bloodworms has a net weight of 7.9 grams (0.28 oz), and costs only approximately US$4.

Dried blood worms are little dried filaments ranging in size from a few cm to tiny dustlike fragments. John grabs a few with his tweezers, hydrates them with a bit of water, and then immediately drags the tweezerful across the surface of a *Pinguicula* or *Drosera* leaf. The wet mass of bloodworm (imagine a microscopic version of chow mein) is retained by the sticky leaf, and the plant can begin digestion. John describes the effect of feeding his terrarium plants as being "Fantastic." John has made me a convert—bloodworms are a great way to feed *Drosera* and *Pinguicula*!

The Carnivorous Syndrome: 7 Time Lapse Films by Mike Wilder



Mike Wilder, ICPS member, has been putting a great effort into developing time lapse videos of carnivorous plants. He is selling seven of his videos via digital format on a CD entitled, "The Carnivorous Syndrome." Mike's production values are very high and the videos are excellent (the 1024×768 image size is equivalent to high definition television). I have tried taking multiple photographs of *Drosera rotundifolia*, and can attest that it is very difficult to repeat the lighting properly, but Mike has overcome this hurdle easily.

The seven videos, their playing times, and the file sizes, are as follows:

Drosera nitidula × *pulchella* (flower opening and crumpling over 7 hours)—8 sec, 22MB

Utricularia calycifida 'Asenath Waite' (flower opening over 3 days)—13 sec, 39MB

Drosera capensis (flowers erumpling over 24 hours)—12 see, 57MB

Dionaea muscipula (new leaf opening over 2 days)—17 sec, 64MB

Drosera closterostigma (leaves opening over 2 days)—12 sec, 74MB

Drosera capensis (leaf digesting food over 14 hours)—14 sec, 94MB

Pinguicula agnata × *moranensis* (flowers and leaves during 6 days)—37 sec, 198MB

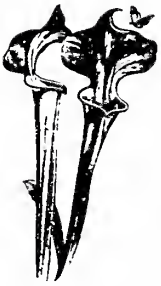
My favorite is probably the 14-hour *Drosera capensis* video. It is fascinating to observe how much digestive juice is secreted by the leaf, and how the leaf curls over the food item.

The files for the pc version are avi format, and can be displayed using a number of computer programs (such as the Microsoft Media Player), while the mac version contains Quicktime files. I played the avi videos on my home machine and they displayed smoothly, drawing many oohs and ahhs from me and my wife (also a carnivorous plant enthusiast). I also played them on my office computer, but the more modest computing power of that machine rendered the videos a little less smoothly. These videos take quite a bit of computing power to really show off their features best. Mike recommends a computer with a processor at least as powerful as a Pentium 3.

To buy the CD, contact Mike at it_290@hotmail.com. At the time of this writing, the priee (including shipping) is US$9.99 (US$11.99 if you are not within the USA). For more information, look at Mike's web site (http://www.geocities.com/pingenstein/timelapse.html).

As a final admonition, I remind you that it would be simple to "pirate" these files. However, Mike put a lot of work into making these videos, and the price he is asking for the files is quite small, so file piracy is quite inexcusable. I am hoping that enough people will buy these so that Mike is eneouraged to make more. They are a lot of fun to watch! I hope that in the future he will reveal how *Sarracenia* pitchers and flowers develop, or how *Nepenthes* and *Cephalotus* pitchers inflate, or how *Drosophyllum* leaves unfurl...

Carolina Carnivorous Gardens



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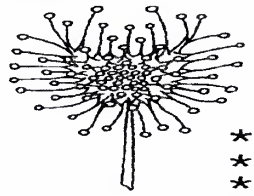

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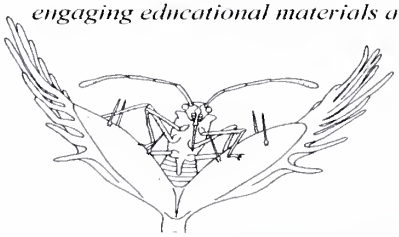

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New Cultivars

Keywords: cultivar: *Sarracenia* 'Leah Wilkerson', *Utricularia* 'Jitka'.

Sarracenia 'Leah Wilkerson'

Submitted: 12 April 2004

This naturally occurring *Sarracenia* hybrid was a chance find while visiting a bog on private property—with permission—in Walton County, Florida in May of 2002. Actually it was hard to miss this outstanding *S.* × *moorei* cross, as it stood head and shoulders above all the *Sarracenia flava* and *Sarracenia leucophylla* plants in the bog because of its sheer size. I have observed this plant in the field for two years and in cultivation for one year. Unlike most *S.* × *moorei* crosses, it displays unbelievable hybrid vigor. The original genet measured over two meters (six feet) across with more than fifty pitchers; the tallest of these measured 130 cm (50 inches) tall, while the heights of the majority of the other pitchers measured between 86-97 cm (34-38 inches). The average lateral measurement of the hood was 17 cm (6.5 inches).

In addition to its gigantic proportions, this hybrid is outstanding because of its stunning coloration. The lower three quarters of the pitchers are lime green, and the pitcher tops are lemon yellow with large areoles and light red veining. The ala is lined in red. The nectar roll is pronounced, undulated and mottled with red; this pigmentation becomes more solid near the column, and forms a throat blotch typical of the *S. flava* var. *rugelii* parentage. The lid is particularly colorful with an overall pale yellow color (verging on white) with regularly spaced strong red veining throughout. From a distance the lid takes on a peachy golden cast. The edge of the lid is edged in red and ruffled, typical of the *S. leucophylla* parent.

This hybrid produces most of its pitchers in the spring—obviously an influence from the *Sarracenia flava* in its ancestry. In cultivation, these spring pitchers regularly reach 86-91 cm (34-36 inches) in height. A second flush of pitchers is also produced in the fall, and as in *S. leucophylla*, these pitchers are even larger, measuring up to 96 cm (38 inches) tall.

The cultivar name honors Mrs. Leah Wilkerson, who has lived her entire life on the property where this plant occurs. About one-third this property is bog habitat. As her father before her did, Mrs. Wilkerson makes sure that the wire grass pasture gets burned every winter. While the family conducted these burns to maintain the pasture for livestock, they were providing the exact conditions to allow the other native plants to thrive, including the pitcher plants. So the name *Sarracenia* 'Leah Wilkerson' honors both Mrs. Wilkerson and her stewardship.

Vegetative propagation is necessary to maintain the unique features of this hybrid. I obtained written permission to collect a sample of this specimen, and it is presently in a private tissue culture lab. Those interested in obtaining specimens of this plant should contact me using the address below.

—Brooks Garcia • 1315 Metropolitan Ave SE• Atlanta, GA 30316-1609• USA • thombrogar@aol.com

Utricularia 'Jitka'

Submitted: 10 July 2004

This plant, created in 2000, is a hybrid made by crossing *U. quelchii* (female) with *U. praetermissa* (male). The plant has the general floral and leaf structure of the paternal parent. The flower color, however, is quite different; while the flowers of *U. praetermissa* are typically white or pale pink with a yellow palate splotch, the flowers of this cultivar are a splendidly rich mauve, with a prominent vitelline palate splotch (see Back Cover).

Figure 1: *Sarracenia* 'Leah Wilkerson': side view (left), top view (right). Photographs by Brooks Garcia.

The leaves are petiolate, with obovate laminae. Each petiole is up to 7 cm long, the lamina measures up to 7 × 3 cm. Including the typical spray of 3-4 flowers, the entire inflorescence is up to 30 cm long. The flower stalk is stiff, and about 2 mm thick. A whorl of three narrow bracts is at the base of each flower pedicel; an additional whorl of bracts occurs on the peduncle, at about 2/3 of the distance from the ground to the lowermost flower. The whorls are rather strange, because they are serried, with two bracts crossed one over the other. The flowers open progressively from below, and thanks to their durability, the earliest flowers to open are still in good condition when the last flower opens, resulting in a very impressive and beautiful show! It is vigorous, and produces flowers frequently, time and time again.

The flowers are large—the lower lip of corolla measures 34 mm in length and 52 mm in width. The smaller, upper lip is shorter than the upper calyx lobe, and is mostly hidden by it. The spur is falcate—it reaches the margin of the lower lip, but does not curve backwards at the apex as does the spur of *U. praetermissa*.

The described cultivar is apparently infertile. However, it readily propagates asexually through division. Also, like both parents, the plant produces underground tuberous stolons bearing brood.

Because the temperature optimum for growing this cultivar is about 16°C, this is a plant best suited for cool and very damp greenhouses. Additional illumination during the winter is recommended. We use small perforated pots (10 cm in diameter), using the same soil mix as for the frequently cultivated *U. alpina*.

I am naming the novelty *Utricularia* 'Jitka' after my pretty friend Jitka Strasserová. The name is in Czech language; the tongue more familiar with English would pronounce it "yit-ka." According to article 32 of the ICNCP, the English translation of the name *Utricularia* 'Judith' may also be used.

—Miloslav Studnicka • Botanic Gardens Liberec • Purkynova 1 • 460 01 Liberec • Czech Republic • botangarden@volny.cz

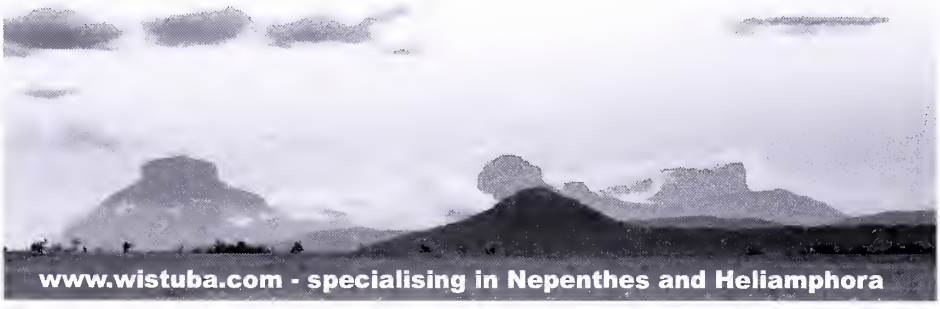
Figure 1: *Sarracenia flava* in Virginia, by Jim Robinson.

Jim Robinson (jimsgarden2001@yahoo.com) writes: This June 2004 photo shows locally native *Sarracenia flava* introduced in 1999 to a Virginia Department of Transportation (VDOT) wetland mitigation site just east of Petersburg. This is part of the efforts by Meadowview Biological Research Station (www.pitcherplant.org) to restore *S. flava* to its historic range in Virginia, using plants propagated from individuals from nearby remnant micro-sites. There are now less than 100 specimens of *S. flava* in these four natural sites in southeast Virginia—all other *S. flava* sites in Virginia have been extirpated. A total of 115 *S. flava* clumps, with pitchers as tall as 79 cm (31 inches), are thriving in this manmade wetland. These plants suffered severe stress during the summer drought of 2002, but recovered quite nicely.

The wetland is monitored by VDOT; it is on a highway right-of-way, and as such the public is not allowed to visit it unless accompanied by VDOT staff. You can learn more about Meadowview Biological Research Station's initiatives at its web site.

Tre Bond (treaqum@yahoo.com) reported on what was told to him by Ms. R. Frasier, longtime resident of Venus flytrap (*Dionaea muscipula*) habitat in North Carolina: In the mid-1940s Venus flytraps abounded on plantation farms. The furrows of the fields were filled with the flytraps, which old-timers called bog-weed. Children around the age of seven would dig up the flytraps to give to their mothers as bouquets. Instead of lemonade stands, the children would sell Venus flytraps to passers-by. In the early 1950s the heavy use of fertilizers and pesticides contributed to a rapid decline in the number of Venus flytraps. After only a few years the last Venus flytraps in the furrows were gone. Children had to walk for a mile or two to find one to show to visitors. In 1962, the last Venus flytrap that Ms. Frasier knew of had died.

Tre also commented on his experiences with growing *Pinguicula*: The most common mistake with *Pinguicula lutea* and *P. pumila* is the failure to pollinate their flowers. Plants in cultivation and in the wild will eventually wither if their flowers are not pollinated. Both of these species will flower until seed is set or the plant dies.



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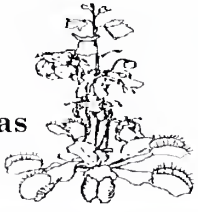

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NAMES OF CULTIVARS REGISTERED IN 2004

Dionaea 'Clayton's Red Sunset', C.Clayton, Carniv. Pl. Newslett. 33: 21 (2004), 8 Sep.
Dionaea 'Cupped Trap', S.Stewart, Carniv. Pl. Newslett. 33: 84 (2004), 30 Dec.
Dionaea 'Louchapates', R.Anfraix, Carniv. Pl. Newslett. 33: 100 (2004), 30 Dec.
Drosera 'Big Easy', W.J.Clemens, Carniv. Pl. Newslett. 33: 84 (2004), 30 Dec.
Drosera 'Rhodesian Beauty', W.Dawnstar, Carniv. Pl. Newslett. 33: 89 (2004), 30 Dec.
Drosera 'Ruby Slippers', W.J.Clemens, Carniv. Pl. Newslett. 33: 52 (2004), 8 Sep.
Drosera 'Tamlin', W.Dawnstar, Carniv. Pl. Soc. J. (UK) 26: 19 (2003), 1 Jun.
Nepenthes 'Hortulanus Otten', A.Vogel, Carniv. Pl. Newslett. 33: 20 (2004), 8 Sep.
Pinguicula 'Enigma', T.H.Wyman, Carniv. Pl. Newslett. 33: 88 (2004), 30 Dec.
Pinguicula 'Florian', O.Gluch, Carniv. Pl. Newslett. 33: 20 (2004), 8 Sep.
Sarracenia 'Bug Scoop', D.Cook, Carniv. Pl. Newslett. 33: 19 (2004), 8 Sep.
Sarracenia 'Hurricane Creek White', J.Hummer, Carniv. Pl. Newslett. 33: 19 (2004), 8 Sep.
Sarracenia 'Katerina', M.Studnicka, Carniv. Pl. Newslett. 33: 83 (2004), 30 Dec.
Sarracenia 'Sorrow', M.Studnicka, Carniv. Pl. Newslett. 33: 83 (2004), 30 Dec.
Utricularia 'Big Sister', B.Rice & M.Studnicka, Carniv. Pl. Newslett. 33: 52 (2004), 8 Sep.
Utricularia 'Enfant Terrible', B.Rice & M.Studnicka, Carniv. Pl. Newslett. 33: 53 (2004), 8 Sep.

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